

# **INTEGRATED COMMUNICATION AND TRANSPORTATION EFFICIENCY – SOME STUDY CASES**

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## **1. SUMMARY**

A critical factor in search, rescue or criminal investigation is time – specifically, the time needed to complete a big number of tasks that occur in any emergency. A critical asset in assisting disaster relief teams and public safety personnel in their mission to save lives and defend property loss is the access to resources data – location of personnel, emergency service resources, streets, buildings. The ability to locate resources, on foot or in vehicles, in relation to the local transportation infrastructure in a specific geographic area need to be considered in a new way of managing emergency situations. The TETRA based systems integrated with a wide range of mapping, tracking, alarming and resource-allocations applications used in conjunction with a dispatcher tool allows operational teams to manage a large ground, water and air-based emergency teams using voice and text communications.

The public safety, maritime (e.g. MRCC, AIS/RIS), air traffic management (civil and military), public transport systems have to be designed in order to cover operational scenarios in which they are interconnected. Like this the best premises for an efficient transportation and emergency relief scenarios implementation are set-up. The challenge is to get the different organisations to agree on the operational scenarios. The technical solutions will support them in these operational scenarios implementation.

This presentation will present two study cases in which different systems are connected in order to support the normal and emergency scenarios of transport on land and waterways.

## **2. EMERGENCY COMMUNICATIONS: A VITAL NATIONAL RESOURCE**

### **2.1 Solutions Overview**

It is a fact that in Europe during the last years the Public Safety organisations e.g. Police, Fire Brigades, Ambulances migrated to TETRA. These organisations are deploying county wide TETRA networks. They have the possibility to share the same physical network with the advantages of reduced costs for the infrastructure and for running the network. Each “virtual” network guarantees the complete independence to the operations of each organisation. TETRA is present in over 100 countries all over the world, except North America.

Originally the standard was developed for public safety but several market sectors are implementing it, including the transportation, utility and industry segments. The number of airports using TETRA for the ground personnel and infrastructure is increasing. In some European countries a new generation of TETRA radio is planned to be used in army training exercises. Also for big aircraft carriers TETRA technology is in use.

For the maritime systems the legacy radios (VHF, MF, HF) are deployed but for “island countries” (e.g. Iceland) it is obvious that the access to the country wide TETRA network is necessary. Tests with TETRA were on one of the largest passenger car ferries in Denmark. Events like the Olympics or Asian Games were successfully supported by TETRA in Athens, Beijing respectively Doha.

In the Public Transport the communication in road tunnels, metros, rail tunnels (e.g. Eurotunnel for emergency communications), underground service tunnels (airports) are TETRA based.

European cities target a well-developed public transport network in terms of local trains, metro lines and buses. But increasing traffic levels in recent years have led to congestion, which has renewed the focus on improving both traffic controls and public transport.

In the public transport organisations the field service personnel use TETRA portables to feed back operational information on the status of the buses, passengers have tickets, and buses are following the established routes. The GPS capability allows monitoring and storing the entire journey. This facility is used in the planning of new routes, timing journeys and monitoring the progress of new drivers. Drivers can be alerted to any traffic congestion, while those at an end station can be informed when the next bus is due.

Moreover, service levels delivered to customers have been improved. It is possible to verify the time a bus arrived at a particular stop and respond to any customer complaints accordingly. It saves time in terms of administration, and also in disciplining drivers.

Travellers can obtain real-time vehicle location information from a specific bus/train stop, by sending a text message from their mobile phones. Location data is also fed into the online national travel planner, which combines all the different modes of public travel.

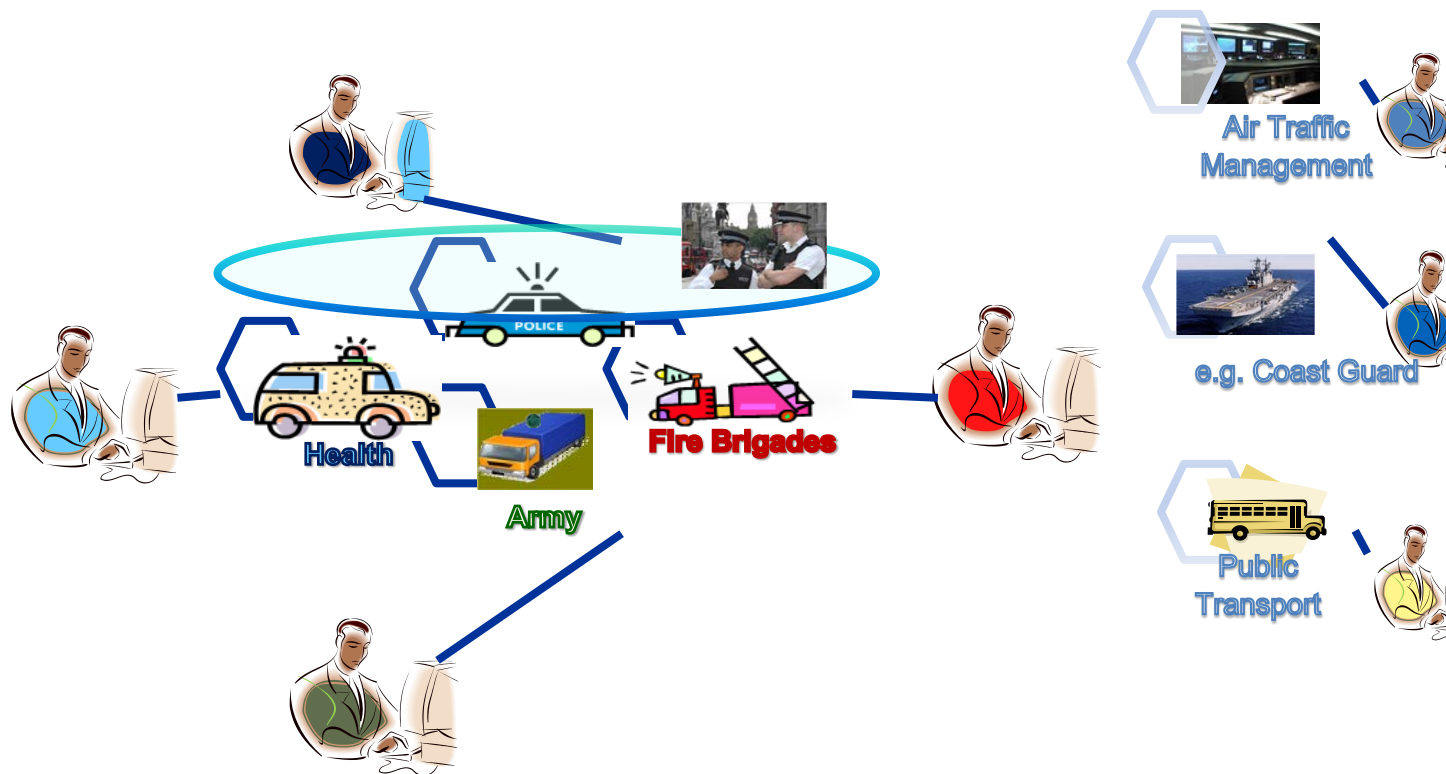


Figure 1: Mission Critical Systems - an overview

The next generation of TETRA is coming to be taken in use in Norway. The TETRA Enhanced Data Service (TEDs) provides higher data rates (10 to 500 kBit/s) and fulfils like this the requirements for faster data services.

Each Public Safety organisation has its own Control Rooms where human dispatchers are handling the incidents. At the Dispatcher working position the information needed for co-ordination and decision taking is provided in real time. Figure 1 gives an overview on the different organisations connected to a single and/or different TETRA networks. The picture does not contain details on organisation specific configurations and sub-systems but Voice Communication Systems, Databases, CCTVs, etc. are only a few.

In each of these organisations the incidents are handled based on the internal procedures and on basic pre-defined operational scenarios. The operational efficiency of each of the listed organisations is impacted by major incidents that can affect big areas with a high population, producing goods damages, delays in the traffic, etc. In case of disaster not only the emergency services but many other organisations and/or utilities have to co-operate in order to be effective. This can happen only if “major incident” operational scenarios were taken into consideration already in the design phase of the systems to be deployed. The technical solution(s) support the operational scenarios even the expectations are that the technical solution shall cover everything.

Disaster or major incidents scenarios have to be taken into consideration in planning the public transport in a big city, planning the ship traffic on the waterways or dimensioning the TETRA network.

During the design and implementation of mission critical communications answers for questions like:

- How shall the system solution be developed in order to enhance resilience, security and responsiveness?
- How to get the most from communications to ensure incident preparedness and civil contingency and business continuity
- Does the design overcome the technical and operational challenges of interoperability?

have to be given.

## **2.2 Public Cellular Network: not adequate for Emergency Communications**

There are some reasons why in case of major incidents the public cellular network is not adequate:

- The networks are not designed for mission critical applications: e.g. non blocking, encryption
- It cannot guarantee service during emergencies, especially disasters.
- It cannot provide fast call set up.
- It cannot provide all-informed network that provide rapid response in emergencies.
- It is not designed to provide powerful PMR services including dispatch functionalities.
- No DMO and fallback facilities (insufficient resilience).
- No group call facility. Needs too many channels for a big group call.
- Insufficient security level for Public Safety users.

The DMO feature ensures to have communication in case the infrastructure is partly damaged.

## **3. MAJOR INCIDENTS**

### **3.1 Operational Scenarios**

Major man-made and natural disasters in recent years have changed the governments' mindset how to respond to these events. In USA the concept of Homeland Security requires increasing co-operation between Police, Fire, Rescue, Health and Military organisations.

Efficient emergency services communication is essential in saving lives, minimising damage to private/public properties. Some municipal transport authority is also considering disaster management plans, whereby the public transportation fleet could be used by rescue teams.

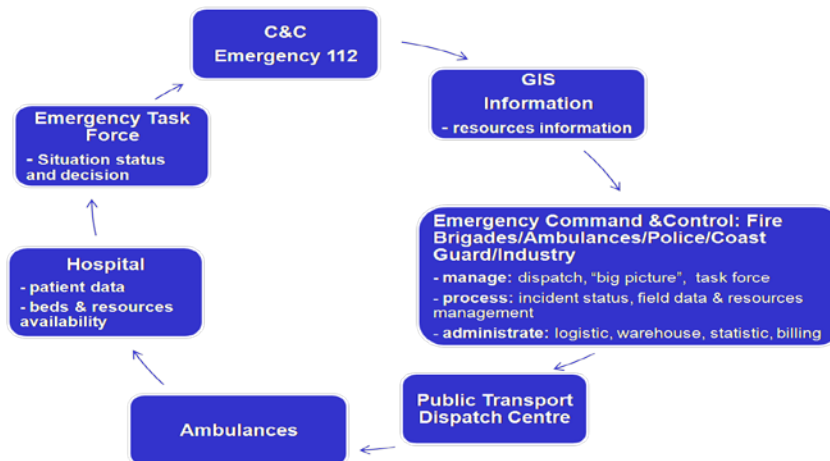


Figure 2: Major Incident Possible Workflow

Figure 2 contains a possible operational scenario for a major incident.

A “Task Force” team will take over the control and administration of all involved organisations up to successfully (in time with as less as possible damages) work of the incident.

In order to have an efficient incident handling some tasks has to be done during the system design and implementation:

- Definition of a task force team: participants, who has the “power to decide”
- Definition of which information has to be provided to the task force team in order to facilitate the decisions on the actions to be done
  - Data on the type of the incident
  - Resources availability in the area near to the place of the incident: cars, specialists, etc.
  - Information on the hospitals in the neighbourhood: the bed availability, doctors and specialists
  - Dispatch and trace of the patients (e.g. who in which hospital)
  - If helicopters shall be used the Air Traffic Management shall be involved for dispatch/coordination of flights over the region
  - Use of mobile service data in order to monitor persons that are in critical situation up to their delivery in the hospital
  - In case dangerous goods at the place of the incidents – information on which types of substances in order to have the material and tools at the incident site
- Interconnection definition of different organisations networks
- Public Transport dispatch centres workflow in order to co-ordinate and re-route the traffic.
- Maritime: in case ships are involved on a waterway (river, sea) the interconnection of communications systems to the Public Safety network (via TETRA gateways, Patching analogue with TETRA radios, etc.) and/or Air Traffic Administration organisation has to be defined and tested (in the e.g. MRCC)

- Connection and communication of the Task force team with local Air Traffic Administrations to be agreed

The implementation of the dispatcher Working Position user interface is of highest importance: it has to give all needed information in order to support the fast decision taking: the information on the incident has to be clear, easy to understand and observe changes



Figure 3: Information Presentation at the Dispatcher Working Position

In the presentation there will be two study cases on two different types of major incidents – based on “virtual” scenarios.

### 3.2 Major Incident in a big city

*Affected areas:* Public Transport, transport of goods, water and gas supply, hospitals. Human injuries.

*Involved organizations:* Public Safety – fire brigades, police, ambulances, Health Ministry, military ambulances and helicopters, Public Transport in the affected city. Interconnection with neighborhood Command and Control Centre.

### 3.3 Major incident on a waterway

*Affected areas:* Transport of goods and people

*Involved organizations:* Public Safety – fire brigades, police, ambulances, helicopters, maritime organisations.

### 3.4 Conclusions

- Only good prepared, agreed and trained operational scenarios will be effective in case on emergency.
- The personnel of all involved organizations have to be good trained.
- The design of the emergency communication systems has to support the operational scenarios. The systems/sub-systems dimensioning has to be done taking in consideration “disaster” scenarios.
- No perfect system from the technical point of view can compensate the missing competence of decision takers

## 4. CHALLENGES

The challenges are related to harmonization and co-operation between the involved parts:

- The communication between the different organizations
  - o The organizations have sometimes very different ways in decision making process
- The operational scenarios have to be decided and agreed by all participants
  - o Workflows can be implemented in order to support in real situation
  - o Personnel trained on the systems and mobiles

- Every person has to know exactly what to do in which situation
- The systems were “load tested” during the acceptance procedures (e.g. split network, gateways, peak in communication volume)

## 5. FREQUENTIS PORTFOLIO

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Figure 4: Frequentis Portfolio